

Nevertheless, since Prachuap Khiri Khan is situated just where numerous peninsular races intergrade with distinct forms of southwestern Siam, it has seemed to me desirable to fix the new name on a much more southern population, rather than simply to rename Kloss's bird. The word "*caecilii*" derives, of course, from this earlier worker's given name.

That the 15 specimens from Ko Kut and Ko Chang should be quite distinct from birds of

the neighboring mainland, but virtually inseparable from those of the Malay Peninsula, is of considerable interest. Their wing length ranges from 81 to 85 mm (11 males), 80 to 83 mm (2 females); they are thus a trifle larger than topotypical *caecilii*, but hardly enough to justify their separation at this time. One example has a few red feathers on the lower throat.

ICHTHYOLOGY.—*Acanthurus triostegus marquesensis*, a new subspecies of surgeonfish, family Acanthuridae, with notes on related forms.¹ LEONARD P. SCHULTZ and LOREN P. WOODS.

During our studies of tropical Pacific Ocean fishes, we observed that in the vast area from the East African coast to the western shores of the Americas certain species said by certain ichthyologists to be the same throughout this entire region are actually separate species, subspecies, or distinct populations. Among these, the surgeonfish, *Acanthurus triostegus* (Linnaeus), is one of the most abundant and widely distributed species of the Indo-Pacific region. It ranges from the Red Sea and Natal coast of South Africa eastward to Australia and thence in Oceania to the offshore American islands—Clarion, Clipperton, and Cocos. In the Hawaiian chain of islands this surgeonfish is represented by a distinct species, *Acanthurus sandvicensis* Streets, and by some means it has extended its range to include Johnston Island, 520 miles southward.

In order to clarify the status of the various species and subspecies of surgeonfishes closely related to *A. triostegus* we studied specimens from the Pacific and Indian Oceans and found that certain of the larger island groups of the Pacific have populations of this surgeonfish morphologically distinct from other island groups. Therefore, we find it necessary to describe as new a subspecies from the Marquesas and to point out other distinct populations without naming them at this time.

Throughout the entire range of this surgeonfish the five narrow dark bars on

the sides show no significant variability. The first body band ends in the axil of the pectoral base. In contrast the dark bar on caudal peduncle varies greatly from a dorsally located spot to one completely encircling the peduncle. Usually it is in the form of a dorsal saddle with a spot ventrally disconnected from the saddlelike dark mark.

The larval stages of this surgeonfish are unknown to us, but numerous examples of postlarvae occur in the U. S. National Museum collections. All have been taken over reefs or near land; those from 21 to 25 mm in length have been collected from tidal pools. The smallest specimen seen by us was 20.5 mm. It was colorless when it appeared at a light at night. This suggests a pelagic habitat for the young.

Acanthurus sandvicensis Streets

Acanthurus triostegus sandvicensis Streets, U. S. Nat. Mus. Bull. 7: 67. 1877. (Type locality, Honolulu Harbor, Oahu, T. H.) Lectotype, U.S.N.M. no. 15398, and paratypes, U.S.N.M. no. 143446.

Acanthurus sandvicensis Streets is characterized by having a black streak running from the upperpart of the pectoral base to near the ventral surface (see Fig. 1, A), and by averaging one or two more soft rays in the dorsal, anal, and pectoral fins. (See Table 1.) The streak below the pectoral was found in all specimens examined (about 100) from the Hawaiian and Johnston Islands and in no specimen from any other locality.

The distinct character of the color pattern of *Acanthurus sandvicensis* and its complete lack of intergradation with representatives of *trio-*

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stegus from other island groups reemphasize the recognized long-time isolation of the Hawaiian Chain. The average temperature of the water around the Hawaiian Islands and Johnston Island is a little lower than the average for most parts of the equatorial western Pacific Ocean. This may have caused the meristic differences recorded for *sandvicensis*, but it does not explain the difference in color pattern.

***Acanthurus triostegus triostegus* (Linnaeus)**

Chaetodon triostegus Linnaeus, *Systema naturae*, ed. 10: 274. 1758. (Type locality, Indies.)

The normal color pattern of alcoholic specimens is a light-gray to dark-brown background on head and body with the dorsal parts darker, and ventral region whitish; middorsal line of interorbital space and of snout usually with a brown streak; head and body with 5 narrow transverse brownish or blackish bars, the first from nape through eye across cheek to lower margin of preopercle, the second from dorsal origin to base of pectoral, the third from below fifth dorsal spine nearly to anus, the fourth from base of second dorsal soft ray to first soft anal ray, and the fifth from about the seventh to ninth dorsal rays to below the eighth soft anal ray; caudal peduncle usually with a narrow black saddle across dorsal surface extending down to about middle of sides, lower part of caudal peduncle usually with a small spot or short dash (sometimes the dorsal saddle is connected with this spot but this character has been found to be too variable to consider here); median fins dusky, the anal with a narrow white margin; pectoral fin translucent.

The normal or typical color mark on the upper part of pectoral fin base (Fig. 1, B) consists of a single dark spot.

Specimens in breeding colors have a distinct lengthwise line along lower sides, below this, body abruptly white, anal fin black basally, often with a broad white margin; the transverse lines on females apparently narrower than those of males.

Variability among island groups.—The specific marks that show consistent variability along certain lines center around the pectoral fin base, such as (1) a dark spot below pectoral fin base, or (2) the elongation of the usual round dark spot into a short bar. These changes usually occur along with an increase of about one additional ray in the dorsal, anal, or pectoral fins.

Among the specimens from the Indian Ocean and western Pacific—Marianas, Marshall, and Samoan Island groups—only an occasional specimen differed from the normal color pattern of *triostegus*. Four out of five specimens from Tahiti had one more pectoral fin ray on both sides, but no color variations. One specimen each available from the isolated Baker, Christmas, and Fanning Islands were normal *triostegus*.

In one-third of the Phoenix Island specimens there occurred either an extra spot, a bar (Fig. 1, D), or an elongate spot (Fig. 1, E), and about one-third had one more pectoral fin ray than the average for *triostegus*. This may indicate a variation in the direction of *sandvicensis*.

Of the six small specimens examined from the Tuamotus, four had a bar across the pectoral base (Fig. 1, D) and two had one spot, and one specimen had an additional pectoral fin ray.

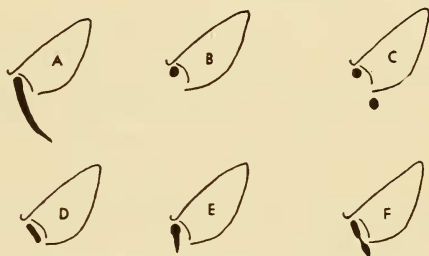


FIG. 1.—Diagram showing different color patterns on base of pectoral fin: A, *Acanthurus sandvicensis*; B, normal *A. triostegus*; C, *A. triostegus marquesensis* (adult); D, bar; E, elongate spot (Phoenix Islands); F, elongate spot (in juvenile *marquesensis*).

No notable difference in color pattern was observed for examples from the American offshore islands of Clarion, Clipperton, and Cocos, but half of them have an extra ray in the pectoral fin. Jordan and Evermann (Bull. U. S. Bur. Fish. 23 (1): 395. 1905) state: "To the Hawaiian species, *Hepatus sandvicensis*, belong the specimens recorded by Jordan and Evermann (U. S. Nat. Mus. Bull. 47, pt. 2: 1690. 1898), from Clarion and Socorro Islands." Our 11 specimens from Clarion have a single spot on the pectoral base with no indication of the extension or streak below the pectoral characteristic of *sandvicensis*. Heller and Snodgrass (Proc. Washington Acad. Sci. 6: 403. 1900) list 37 specimens from Cocos Island and say: "All of the Revillagigedo and Cocos specimens differ from Hawaiian specimens of the very closely related *Hepatus sandvicensis*

(Streets) in lacking the black band reaching from the base of the pectoral to the base of the ventral. There is a dark spot on the outer side of the base of the pectoral and in some a similar spot below this one." This is in harmony with our findings.

Acanthurus triostegus is one of the few tropical Indo-Pacific species that crosses the East Pacific Barrier (Ekman, 1935, pp. 105-107). One would suppose this Eastern Pacific-American area to be more isolated than any of the Central Pacific island groups, yet we can detect no significant variation.

Acanthurus triostegus marquesensis,
n. subsp.

Hepatus triostegus Fowler, Proc. U. S. Nat. Mus. 80: 10. 1932.

Holotype.—U.S.N.M. no. 89771, Marquesas Islands, Ua Huka, September 24, 1929, Gifford Pinchot, 84.3 mm.

Paratypes.—U.S.N.M. no. 143447, same data as holotypes, 13 specimens, 49 to 86 mm; C.N.H.M. nos. 23065, 23066, Marquesas Islands, Nuka Hiva Island, February 7, 1929, Crane Pacific Expedition, 2 specimens, 31 and 38 mm; C.N.H.M., nos. 23062, 23063, 23064, Marquesas Islands, Hiva Oa Island, February 6, 1929, Crane Pacific Expedition, 3 specimens, 25.7 to 28.5 mm.

Description.—(The counts and measurements of the holotype are given first, the range of variation of paratypes in parentheses, measurements expressed in thousandths of the standard length.) Dorsal rays IX, 24 (IX, 22 to 24); anal rays III, 21 (III, 19 to 21); pectoral rays I, i, 14 (13 or 14); pelvic rays I, 5 (I, 5); branched caudal rays upper lobe 7, lower lobe 7; teeth on one side of jaws, upper 7 (7), lower 8 (7 or 8).

Depth of body 529 (510 to 605); length of head (tip of snout to upper edge of gill opening) 312 (315 to 331); length of snout 193 (176 to 198); diameter of eye 93 (93 to 136); least depth of caudal peduncle 109 (110 to 127); length of pectoral fin 173 (268 to 321); posterior part of head (hind margin of eye to upper edge of gill opening) 54 (51 to 78); lower lobe of caudal fin 284 (268 to 315), upper lobe 285 (277 to 333); interorbital width 91 (94 to 125); length of caudal spine 32 (29 to 47; angle of snout profile 57 (54 to 56); snout profile slightly concave convex in young; caudal fin slightly forked.

Color.—In alcohol, head and body dark brown, with five transverse narrow dark lines, the first from nape through eye to lower margin of preopercle, the second from origin of spiny dorsal to axil of pectoral fin, the remaining three as described for *triostegus*; dark line form-

TABLE 1.—COUNTS AND COLOR CHARACTERISTICS RECORDED FOR ACANTHURUS TRIOSTEGUS AND A. SANDVICENSIS

Species and Locality	Dorsal rays								Anal rays						Pectoral rays			Coloration of pectoral base			
	VIII	IX	X	21	22	23	24	25	III	18	19	20	21	22	I, i, 12	I, i, 13	I, i, 14	One spot	Bar	Two spots	Streaks
<i>Acanthurus triostegus triostegus</i> :																					
Indian Ocean, Mauritius; Seychelles.....	—	11	1	—	6	5	1	—	12	1	1	7	3	—	—	12	—	10		2	
Sumatra; New Guinea; Solomons; Philippines...	—	10	—	1	3	6	—	—	10	—	3	6	1	—	2	8	—	10			
Okinawa; Japan.....	—	7	—	—	2	4	1	—	7	—	3	3	1	—	—	7	—	5	1	1	
Guam; Marshalls.....	—	21	—	—	7	13	—	1	21	—	2	17	1	1	—	17	4	21			
Niufu; Samoa.....	—	8	—	—	3	4	1	—	8	—	—	5	3	—	—	6	2	7		1	
Phoenix Islands.....	—	11	—	—	1	8	2	—	11	—	—	7	4	—	—	10	6	30	10	3	
Tahiti.....	1	3	—	—	1	2	1	—	4	—	1	2	1	—	—	2	6	4			
Tuamotus; Mangareva; Takaroa.....	—	6	—	—	1	5	—	—	6	—	—	4	2	—	1	11	2	2	4		
Eastern Pacific, Clarion, Clipperton; Cocos Islands.....	—	14	—	2	2	9	1	—	14	—	2	6	5	—	—	7	7	14			
<i>Acanthurus triostegus marquesensis</i> :																					
Marquesas.....	—	14	—	—	2	10	2	—	14	—	1	6	7	—	—	10	24		4	15	
<i>Acanthurus sandvicensis</i> :																					
Hawaiian and Johnston Islands.....	—	32	—	—	1	13	16	2	32	—	1	5	24	2	—	5	27				32

ing saddle over dorsal surface of caudal peduncle extending down sides of caudal peduncle and joining with spot on lower side on one side, lower spot separate on other side (these are joined on at least one side in 5 paratypes, separate on both sides in 17); holotype and paratypes 49 to 86 mm, with a large distinct spot below the pectoral fin base (Fig. 1, C); young specimens 25.7 mm have a faint dark bar about twice as long as diameter of pectoral base, narrowing and fading ventrally but not as long as in *A. sandvicensis*; in the 31-mm specimen the pectoral spot is conspicuous and in the form of an elongate bar, pinched in the middle and tapering ventrally; on one 38-mm example the bar has completely divided into a short bar across the base of pectoral in one side and lower half is more or less rounded into a spot as those of 49 to 86 mm, but on the other side the division into two parts is not quite complete

(Fig. 1, F). A distinct spot on pectoral fin base; a small faint spot near lower edge of gill opening, and 3 faint spots in line along side of breast, median fins dark, the anal with a narrow white border; pelvis dark, their outer margin and tips pale.

Remarks.—On all the Marquesas Islands specimens occurs a large dark spot below the pectoral fin base except in very small specimens as described above in addition to the usual spot on the pectoral base. Only occasional specimens of *A. triostegus triostegus* from other parts of the Pacific and Indian Oceans have this additional spot. In the Marquesas Islands this extra spot occurs along with a consistently higher average number of anal and pectoral fin rays, thus separating the new subspecies from *A. triostegus triostegus*. Named *marquesensis* after the island group where this subspecies occurs.

ZOOLOGY.—*The tardigrade fauna of the District of Columbia.*¹ CHARLES B. CURTIN,² Catholic University of America. (Communicated by E. G. REINHARD.)

The Tardigrada constitute a group of microscopic animals usually included, as a class, in the phylum Arthropoda. All are hygrophilous, but some species are restricted to marine and fresh-water habitats. Their distribution is world-wide, the number of species being greater in the sub-Arctic than in the tropical regions. No reference to a study of the Tardigrada of the District of Columbia was found in the literature, but Marcus (1929, p. 576) and Mathews (1938, pp. 624–626) listed one species, *Macrobiotus hufelandii* C. Schultze, as an inhabitant of this area. The results of a survey conducted by the writer in this region are contained in this paper.

Packard (1873, p. 740) was the first to note the presence of a tardigrade in the United States, but his description is unfortunately inadequate. A tardigrade from

New Gloucester, Maine, was described by Beal (1880, p. 593). The species, however, can not be determined with accuracy. Mathews (1938, p. 625) stated that it fits the description of *Hypsibius augusti* Murray. To date, 14 species of Tardigrada have been reported for the United States. Of this number, two, *Batillipes mirus* Richters and *Bathyechiniscus tetronyx* Steiner, are marine species. The two described by Packard and Beal are incertae sedis. None of the species reported for the United States are peculiar to this country as they have been previously noted as inhabitants of other countries.

Terrestrial Tardigrada inhabit lichens and mosses while aquatic species may be found on water plants. Richters (1927, pp. 1–3) noted that the tropical mosses were poor both in species and number. In his survey, Murray (1907, p. 515, and 1913, p. 136) listed 25 species of Tardigrada from South Africa. The exact localities of the collections were not given, but from the regional topography the average elevation was 4,000 feet. Teunissen (1938, pp. 6–15) listed 1,200 meters as the lowest elevation

¹ A contribution from the Department of Biology, the Catholic University of America, Washington, D. C. This paper, prepared under the direction of Dr. E. G. Reinhard, is based on the author's dissertation submitted in partial fulfillment of the requirements for the degree master of science. Received January 16, 1948.

² Now biology instructor at Mount St. Mary's College, Emmitsburg, Md.